



1995

1995 Magnetic declination

UTAH

QUADRANGLE LOCATION

DESCRIPTION OF MAP UNITS

- Qal

Stream alluvium (Holocene) - Mostly sand with scattered pebbles and cobbles and few boulders of sandstone; unfossilized wood and man-made debris in vicinity of Hildale. Lesser amounts of interbedded mud and silt. Generally reddish brown to pale brown; sand mostly fine to medium, well stratified, cross-bedded. Probably less than 10 feet (3 m) thick along South Creek, Broad Hollow, and Cottonwood Canyon; possibly 100 feet (30 m) or more thick along Short Creek. Includes low terraces to about 5 feet (1.5 m) above current stream levels.
- Qat

Terrace alluvium (Pleistocene) - Sand and gravel, reddish brown, tabular bedded to fluvial cross-bedded; contains mostly matrix-supported, pebble-sized, subrounded clasts of sandstone, but includes cobbles and boulders as much as 1.5 feet (0.5 m) in diameter; unit fines upward. Exposed deposits are about 6 to 8 feet (2-2.4 m) thick along Broad Hollow and Cottonwood Canyon, as much as 20 feet (6 m) thick along South Creek, and as much as 80 feet (24 m) thick along Short Creek.
- Qat₁

Young fan alluvium (Holocene) - Sand like that in unit Qal but crudely bedded; contains scattered pebbles and cobbles of sandstone and "ironstone" (iron-oxide-cemented sandstone and siltstone), distributed on sloping fan-like surfaces that are well developed along Broad Hollow, where the deposits overlie unit Qac; less common in the high-walled canyons of other main drainages. Estimated to be 2 to 20 feet (0.6-6 m) thick.
- Qat₂

Old fan alluvium or pediment surface deposits (Pleistocene?) - Locally derived reddish-brown silt and sand and matrix-supported pebble- to cobble-size gravel lenses and rare subangular boulders; stabilized by low vegetation, locally covered by eolian sand; forms moderately dissected low-angle surfaces that slope away from valley walls; few feet to more than 25 feet (8 m) thick.
- Qac

Mixed alluvium and colluvium (Holocene) - Mostly reddish-brown to light-brown sand eroded from the Navajo Sandstone and reworked by sheet flow and wind. Contains few pebbles and silt to clay admixtures, relatively smooth surfaces are generally low angle, planar to curving, but without morphology characteristic of fan deposits. Deposits thicken downslope toward stream channels and interfingering with fluvial and other mass-wasting deposits. Contains unmapped small bedrock areas. Thickness possibly as much as 20 feet (6 m).
- Qc

Colluvium (Holocene) - Mostly pebble- to boulder-sized debris, unsorted, sand- to clay-size fractions; masks bedrock on steep slopes largely below Navajo Sandstone and Springdale Sandstone Member of Moenave Formation. Includes massive blocks of sandstone as much as 30 feet (9 m) in diameter and some talus. Deposits range from crudely sheet-like to linear gully fills, commonly modified by sheet flow. Thickness 2 to 30 feet (0.6-9 m).
- Qmf

Debris-flow and rock-slide deposit (Holocene to Pleistocene?) - Locally derived rubble of unsorted sand, sandstone, silt and clay, reddish brown to reddish orange, matrix- and clast-supported, generally present as narrow lobate forms, commonly unstable. Thickness 2 to 20 feet (0.6-5 m).
- Qms

Landslide debris (Holocene to Pleistocene) - Chaotic mixture of clay- to sand-matrix-supported clasts ranging from granule-size to angular blocks of Navajo Sandstone many hundreds of feet long. Characterized by modified scarps, Toreva-like blocks, and disturbed bedrock with contorted bedding and steep dips. Thickness may be as much as or more than 100 feet (30 m). Unit where exposed along South Creek drainages is part of a larger slide complex that extends northward beyond quadrangle boundary. Petrified Forest Member of Chinle Formation is the main unstable bedrock unit underlying the landslide complex.
- Qes

Eolian sand, sheet-flow deposits, and residuum, undivided (Holocene and Pleistocene?) - Sand, fine to medium, and minor silt, orange, pink, and yellowish gray; occurs as veneer of mostly stabilized sheet sand and irregular fillings in bedrock hollows and along intermittent drainages mostly in upland areas. Grades downslope to alluvium. Locally includes small unmapped outcrops of bedrock. Thickness 1 to 5 feet (0.3-1.5 m).
- Qed

Eolian sand in dunes and dune ramps (Holocene and Pleistocene?) - Sand as above deposited in dunes and dune ramps flanking steep slopes and cliffs. Locally consists of older, stabilized deposits and younger, active deposits. As much as 50 feet (15 m) thick.
- Jn

Jnp

Jnb

Navajo Sandstone (Lower Jurassic) - Sandstone, generally light brown on fresh surfaces, weathers to a variety of brown, orange, gray, red, and pink hues; quartzose; well sorted, mostly fine to medium grained, moderately friable, mostly massive, with sweeping high-angle, wedge-planar to tabular-planar, tangential cross-beds in sets 5 to 30 feet (1.5-9 m) thick of probable eolian origin. Cement is mostly calcareous and siliceous with lesser iron and manganese oxides. The "pink or vermilion" unit (Jnp), in which cross-bed sets are thick and conspicuous, commonly weathers to curving surfaces, "bosses" and rounded ledges. Basal 200 to 400 feet (61 - 122 m) "gray and reddish-brown" unit (Jnb) is resistant, ledge-forming, composed of minor planar sandstone interbeds of probable fluvial origin and cross-bed sets generally thinner than those in unit Jnp. Distinction between Jnp and Jnb units is unclear in western part of quadrangle (undifferentiated unit Jn), as well as in the adjoining Smithsonian Butte quadrangle (Moore and Sable, 1992) to the west.
- Jk

Kayenta Formation (Lower Jurassic) - Siltstone, sandstone, mudstone and shale, reddish orange to pale red; sandstone is quartzose, silty, and very fine grained. Bedding is broadly lenticular, some sandstone units contain trough cross-beds with features that suggest point-bar forms. Mudstones are variegated; some beds in lower part of formation resemble those in the Chinle Formation (below), being slippery and unstable when wet. Sandstone units about 30 feet (6 m) thick in middle and lower part of formation exhibit eolian-type cross-beds, may be correlative with Lamb Point Tongue of the Navajo Sandstone. Coarsens upward; uppermost 50 to 100 feet (15-30 m) is largely cliff- or ledge-forming sandstone and siltstone. About 600 to 630 feet (183-192 m) thick.
- Jms

Moenave Formation (Lower Jurassic) - Consists of three members (descending): Springdale Sandstone, Whitmore Point, and Dinosaur Canyon Members, the latter two combined as one map unit. Total thickness more than 350 feet (107 m).
- Jms

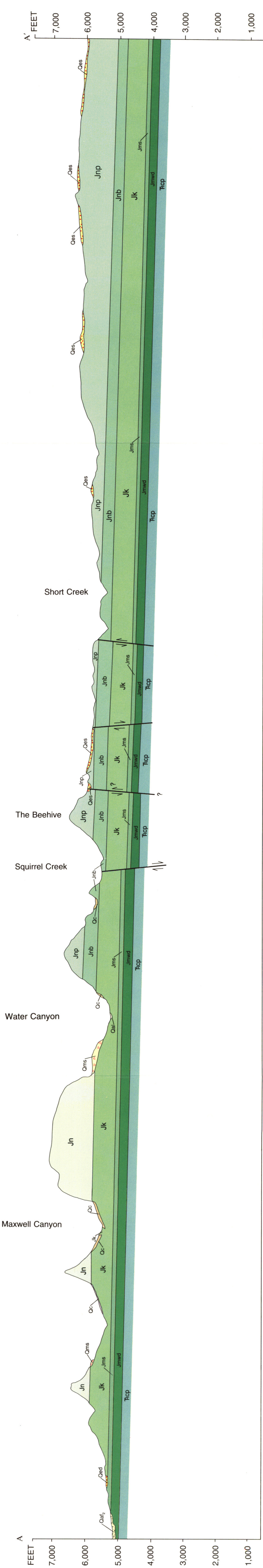
Springdale Sandstone Member - Sandstone, pale red to light brown, quartzose, weathers grayish orange, blocky to flaggy, generally tabular bedded, but with some lenticular beds and trough cross-bedding. Characterized by intermittent lenses a few inches thick of intraformational conglomeratic sandstone and conglomerate with 0.1 to 2 inches (0.2-5 cm) claystone clasts. Uppermost beds tabular, locally stained to moderate yellow hue. Resistant quartz-cemented cliff-former, about 115 to 125 feet (35 -38 m) thick.
- Jmwd

Whitmore Point and Dinosaur Canyon Members, undivided - Whitmore Point Member is slope-forming, pale-red and light-greenish-gray siltstone and claystone and interbedded minor pale-red sandstone, about 50 to 60 feet (15-18 m) thick. Dinosaur Canyon Member is slope- and ledge-forming, ripple-marked, reddish-brown and light-greenish-gray siltstone and mudstone and lesser very-fine-grained quartzose sandstone. About 200 feet (61 m) thick.
- Jcp

Chinle Formation (Upper Triassic) - Two members are present in the map area, the Petrified Forest Member and underlying Shinarump Member, but the Shinarump is not exposed. Total thickness of Chinle is more than 450 feet (137 m) thick.
- Jcp

Petrified Forest Member - Varicolored (gray, red, purple, brown) slope- and badlands-forming, tabular-bedded clay shale and clay with volcanically derived clay minerals and minor gray fluvial sandstone and conglomerate. Unstable when wet; contributes to mass movement of overlying units. Upper contact is an erosional unconformity. Only upper, roughly 150 to 200 feet (46-61 m) are exposed in the quadrangle. Total thickness in adjoining Smithsonian Butte quadrangle is about 380 feet (116 m) (Moore and Sable, 1992).

CORRELATION OF MAP UNITS



MAP SYMBOLS

- Contact - Dashed where approximate or inferred. Contact of Quaternary units approximate.
- High-Angle Fault - Bar and ball on downthrown block; dashed where approximately located or inferred; dotted where concealed; queried where inferred
- Joint in Navajo Sandstone
- Linear Feature Observed on Aerial Photographs - May be fault or joint trace.
- Structure Contour - Datum, top of Moenave Formation; extrapolated where land surface is below datum; contour interval 100 feet.
- Dominant Dip Direction of Cross-beds in Navajo Sandstone
- Top of Prominent Sandstone Units in Kayenta Formation - Probably includes Lamb Point Tongue of Navajo Sandstone.
- Scarp - At head of slump, toreva block, or landslide; queried where inferred; hachures indicate direction of movement.
- Direction and Degree of Slope of Alluvial Fan or Pediment Surface
- Coherent Slide Block of Navajo Sandstone

PERIOD	EPOCH	FORMATION	MEMBER	SYMBOL	THICKNESS Feet (Meters)	LITHOLOGY
JURASSIC	Lower Jurassic	Navajo Sandstone	"pink" or "vermilion" unit	Jnp	1465+ (447+)	
			"gray and reddish-brown" unit	Jnb		
		Kayenta Formation		Jk	600-630 (183-192)	
TRIASSIC	Upper Triassic	Chinle Formation	Petrified Forest Member	Jcp	380+ (116+) 450+ (137+)	
			Shinarump Member		380+ (116+)	
	Middle (?) and Lower Triassic	Moenkopi Formation	upper red member		1200-1350 (365-411)	
			Shnabkaib Member			
PERMIAN	Lower Permian		middle red member		1200-1350 (365-411)	
			Virgin Limestone Member			
			lower red member			
			Timpoweap Member			
PERMIAN	Lower Permian		Kaibab Limestone		7-1	